University of Saskatchewan

College of Engineering

GE 348.3 Engineering Economics

Midterm Examination

Time: 80 minutes November 3, 2005

- Open notes and references provided by WebCT
- Be neat
- Show ALL work
- Show all cash flow diagrams
- Write your name and student number

Question	Marks Available	Marks Obtained
1	10	3
2	10	8
3	15	10
4	10	10
5	15	6
6	20	6
7	15	11
8	5	1
TOTAL	**100**	55

Name: Dave Pedersen

Student Number: 141723

/10

10

1. The management of an expanding manufacturing firm is considering a proposal from a consulting group to introduce a new method of training inexperienced machine tool operators. The consultants claim that their program will produce savings of $7,000 per year over the planned 5-year life of the project. Immediate costs to implement the program are $12,000, and annual training expenses will be $4,000. The firm uses 6 percent annual interest for cost comparisons.

   Should the firm accept the proposal, assuming all other factors are negligible?

CFD.

3/3

present cost

why are you calculating future worth?

$NFU = (-12,000 + 3000(F/P, i=6\%, N=5)$

$= -12,000 + 3000(5.637)$

this came from F/A, not F/P?

$NFU = 4911.3$ ✗

the firm should accept the proposal

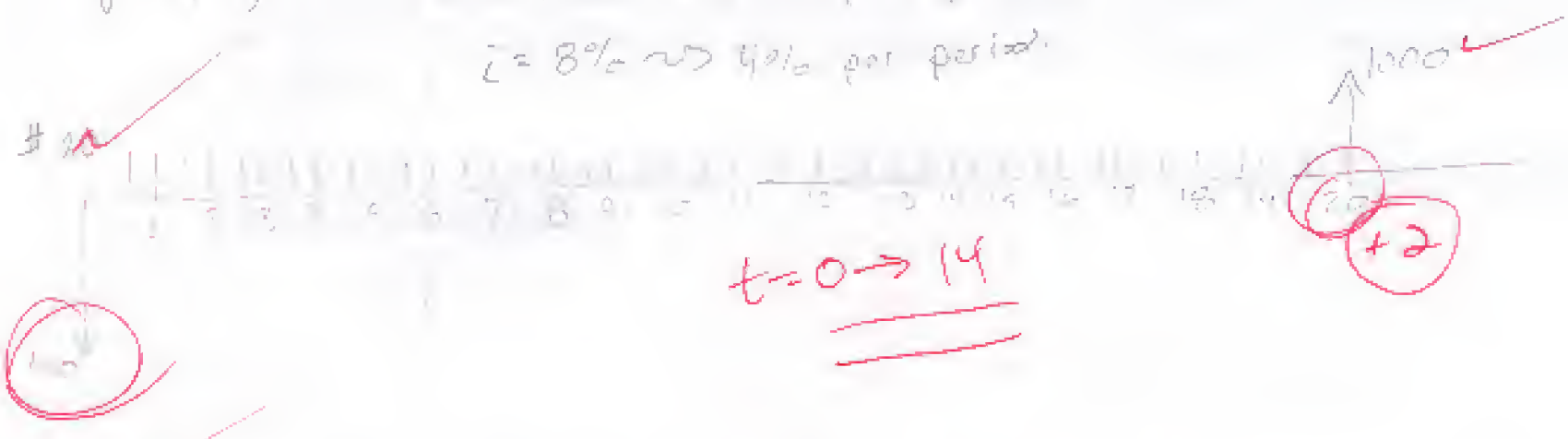
3/10

/10 2. A utility company sold an issue of 4% bonds 6 years ago. Each bond has a face value of $1,000, is due in 14 years, and pays interest twice a year (2% per period). Because interest rates on savings have climbed in recent years, the bond can now be sold on the bond market for only $760.

If a buyer wants his or her investment to earn 8% compounded semi-annually and must pay a brokerage charge of $20 to purchase each bond, is the current market price low enough to provide the desired return? If not, how much should the purchase price of the bond be so that the purchase price of the bond be so that the purchaser breaks even?

$V = \$1{,}000$ $r = 4\% \rightsquigarrow 2\%$ per period

$i = 8\% \rightsquigarrow 4\%$ per period



$P = 20\left[\frac{(1.04)^{28}-1}{.04(1.04)^{28}}\right] + 1000/(1.04)^{28}$

+5

+1

$P = 446.13 + (20\$ \text{ Fee}) \rightarrow \$760$ Not low enough to provide 8% return

To break even.

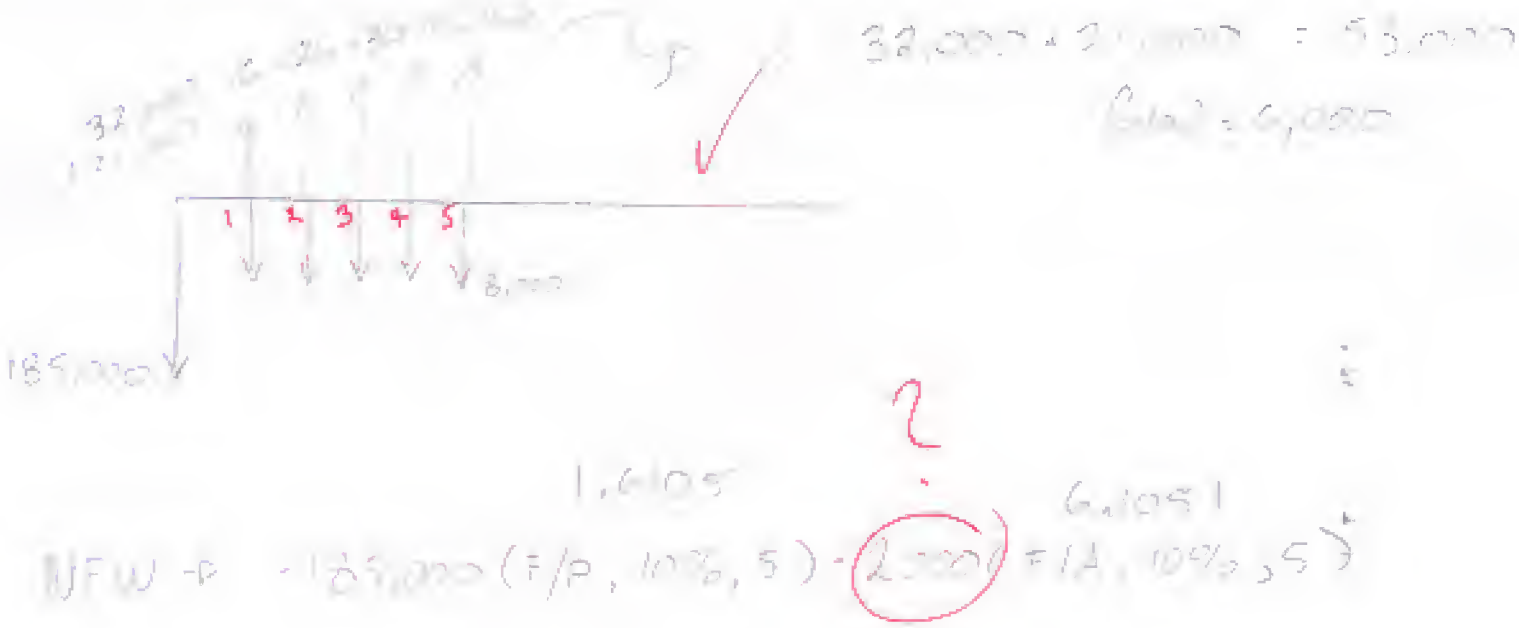
$P = 1000(P/F, i=2\%, N=28) = \frac{1000}{(1.02)^{28}} = 574.37$

8/10

/15 3. Kiddytoyz is a small novelty toy manufacturing company that is considering moving to a 'just-in-time' (JIT) approach. JIT is a manufacturing philosophy where everything needed arrives at exactly the right time, equipment is supposed to operate without failure, and quality is perfect (zero defects). It is estimated for Kiddytoyz that the JIT first costs for equipment and tooling modifications will be $185,000. Annual maintenance and operating costs will increase due to the need for reliability improvements. These increases over the current operation are estimated to be a constant $8,000 per year.

Potential inventory reductions are estimated to be $32,000 for the first year with further arithmetic gradient reductions of $4,000 per year for the following 4 years. Also, production rates are expected to increase, leading to an increase in income of $21,000 for the first year with $2,000 per year increases in each of the following 4 years.

Should JIT be considered? An interest rate of 10 percent is used for economic justification analyses.



185,000

NFW = -185,000 (F/P, 10%, 5) - 2,000 (F/A, 10%, 5)

- 6000 (F/G, 10%, 5)

NFW = -297941.75 - 13310.2 - 6630.6

NFW = 24301.55 X

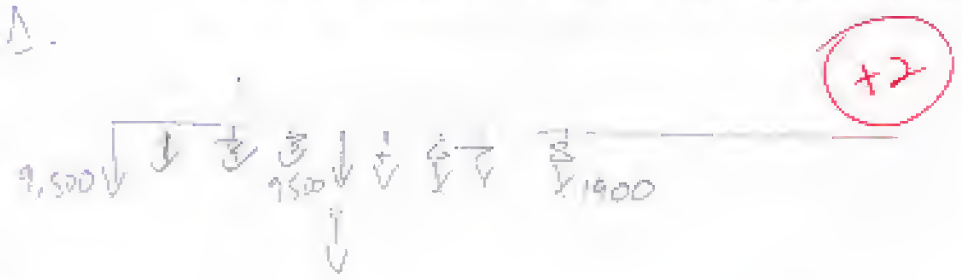
↳ yes JIT should be considered ✓

10

/10 4. Two models of small machines perform the same function. Type 1 machine has a low initial cost of $9,500, relatively high operating costs of $1,900 per year more than those of the type 2 machine, and a short life of 4 years. The more expensive type 2 machine costs $25,100 and can be kept in service economically for 8 years. The scrap value from either machine at the end of its life will barely cover its removal cost.

Which is preferred when the minimum attractive rate of return is 8 percent?

Type 1



MARR: 8%

Type 2

.7350 5.7466

$NPW_1 = -9500 - 9500(P/F, i=8\%, N=4) - 1900(P/A, i=8\%, N=8)$

$= -27401.04$ +2

↑ worse.

$NPW_2 = -25,1000$ +2

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Preferred investment option:	Type 2 +2

/15 5. April has a bank deposit now worth $796.25. A year ago it was worth $750.00. What was the nominal monthly interest rate on her account?

CFD?

The effective annual interest rate = i_e

$750(1+i_e) = 796.25 \quad = \quad \frac{796.25}{750} - 1 = .06166$

$= 6.166\%$ ✓

nominal monthly rate

$i_e = \left(1 + \frac{r}{m}\right)^m - 1 \quad \left((i_e+1)^{1/m} - 1\right) m = r$

$\left((1.06166)^{1/12} - 1\right) 12 = r$

$r = 6\%$ nominal yearly

Monthly.

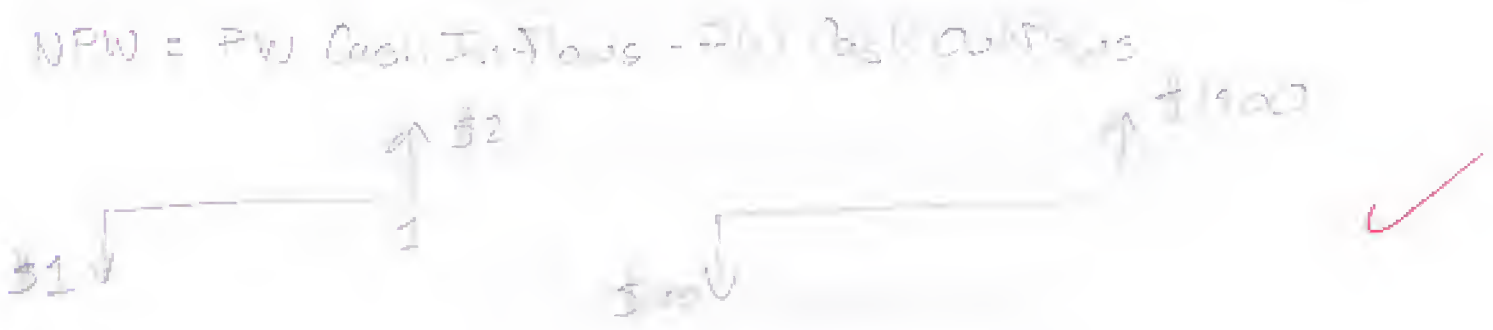
✓

Nominal monthly interest rate:	6%

6

X

/20 6. Consider two investments. The first costs $1 today and returns $2 in one year. The other costs $1,000 today and returns $1,900 in one year. Using a rate of return method, which is the preferred investment option if your MARR is 70% (yes, seventy percent!).



Preferred investment option:	$1 that returns $2.